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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,362	10/30/2001	Paul Joseph Stewart	200-1772	2674
7590	10/07/2005		EXAMINER	
Beverly M. Bunting Gifford, Krass, Groh, Sprinkle, et al. Suite 400 280 N. Old Woodward Avenue Birmingham, MI 48009-5394			NGUYEN, KIMBINH T	
			ART UNIT	PAPER NUMBER
			2671	
			DATE MAILED: 10/07/2005	

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/020,362	STEWART ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Kimbinh T. Nguyen	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

1) Responsive to communication(s) filed on 21 June 2004.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

4) Claim(s) 1-18 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-18 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
     1. Certified copies of the priority documents have been received.  
     2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
     3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

1) <input type="checkbox"/> Notice of References Cited (PTO-892)	4) <input type="checkbox"/> Interview Summary (PTO-413)
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)	Paper No(s)/Mail Date. _____
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____	5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)
	6) <input type="checkbox"/> Other: _____

## **DETAILED ACTION**

1. This action is responsive to amendment filed 06/21/04.
2. Claims 1-18 are pending in the application.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5-8 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart et al. "A real-time, interactive method for fast modification of large-scale CAE mesh models", Published September 2000 in view of Beale, U.S. (5,923,329).

**Claim 5,** Stewart discloses a method of direct mesh manipulation of a mesh model (see abstract) for the CAD of a product (modifying CAD models in a commercial CAD system; see page 1 "Introduction"), said method comprising the steps of: selecting a geometric model, wherein the model is a computer aided design (CAD) format (a method previously conceived for manipulation of CAD surfaces (see page 2 "Introduction")); converting the CAD model into a mesh model (for manipulation of CAD surfaces, a direct mesh modeling technique was developed to allow the designer to quickly modify a mesh model by adding features to it; see page 2 "Introduction"); iteratively evaluating the mesh model until a predetermined response is generated by performing a CAE analysis of the mesh model (determining whether to vary a design parameter many of test traditionally performed on physical prototypes can be conducted

with CAE simulations on finite element mesh models; many CAE applications require that the test be run on several revisions of a model; see page 1 "Introduction"); based on the CAE analysis (see section 1 "Introduction" pages 1-2); modifying the predetermined design parameter, if determined to vary a design parameter (see pages 2-3, sections "Introduction", "Direct surface manipulation applied to meshes", "Implementation doe real time interaction" and "Establishing connectively information"); updating the mesh model to include the modified design parameter using direct mesh manipulation (DMM) of the mesh model (see section "Establishing connectively information"), Stewart doe not teach using a Dirichlet parameter distribution; however, Beale teaches a surface of the mesh model affected by the modified design parameter is described using a Dirichlet parameter distribution to determine a displacement of the surface (col. 11, lines 9-15); and Stewart teaches modifying the surface of the mesh model by the amount of the displacement (finding edge and vertex neighbor or edge neighbor array; see section "Implementation for real-time interaction"); and using the evaluation of the mesh model in the design of the product (see "Implementation and results). It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the Dirichlet parameter distribution taught by Beale into the direct surface manipulation or Stewart for using a Dirichlet parameter distribution in to mesh modification, because using Dirichlet parameter distribution, it would satisfy a condition of orthogonality at all boundaries (col. 11, lines 9-11).

**Claim 6,** Beale discloses defining an influence center for the feature (column 1 lines 30-50, whatever is modified is the influence center); modifying a mesh for the

feature to include a node at the influence center (column 1 lines 30-50 and column 3 lines 15-25); and applying the Dirichlet parametric distribution (column 11 lines 8-14) to the mesh of the feature to determine displacement of each node within the feature (column 1 lines 30-50, wherever the mesh is modified the nodes are displaced from the original position. Although Beale does not specifically disclose bounding a feature on the surface of the model with a closed curve, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

**Claim 7,** Beale discloses using finite element analysis (any analysis on the modified feature is finite element analysis, column 1 lines 30-50) to determine the displacement from the Dirichlet parametric distribution (column 1 lines 30-50 and column 11 lines 8-15).

**Claim 8,** Beale discloses wherein the maximum displacement of the surface is at the influence center (column 1 lines 30-50). It is inherent that in the modified portion the center is the part that is displaced maximally.

**Claim 12,** Stewart discloses selecting a geometric model, wherein the model is in a computer aided design (CAD) format (see page 2 "Introduction"); converting the CAD model into a mesh model (for manipulation of CAD surfaces, a direct mesh modeling technique was developed to allow the designer to quickly modify a mesh model by adding features to it; see page 2 "Introduction"); evaluating the mesh model using computer aided engineering (CAE) analysis (see page 1 "Introduction"); determining whether to vary a predetermined design criterion; modifying the predetermined design

criterion, if determined to vary the design criterion; updating the mesh model to include the modified design criterion using direct surface manipulation (DSM) of the mesh model; wherein a surface of the mesh model is embedded within a lattice structure having a volume, a point within the volume is modified, and finite element analysis is applied to determine displacement of each node within the lattice, modifying the surface of the mesh model by the displacement; and using the updated mesh model (see pages 1-5).

5. Claims 1-2, 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart et al. "A real-time, interactive method for fast modification of large-scale CAE mesh models", Published September 2000 in view of Beale, U.S. (5,923,329) and Hariya et al. (6,578, 189).

**Claim 1**, Stewart discloses a system for direct mesh manipulation of a mesh model (see abstract and introduction, page 1), comprising: a computer system; wherein said model is in a computer-aided design (CAD) format (see page 2 "Introduction"); and a user using the computer system to convert the CAD model into a mesh model (for manipulation of CAD surfaces, a direct mesh modeling technique was developed to allow the designer to quickly modify a mesh model by adding features to it; see page 2 "Introduction"), iteratively evaluate the mesh model until a predetermined response is generated by performing a computer aided engineering (CAE) analysis of the mesh model (many of test traditionally performed on physical prototypes can be conducted with CAE simulations on finite element mesh models; many CAE applications require that the test be run on several revisions of a model; see page 1 "Introduction"),

modifying a design parameter based on the CAE analysis (see pages 2-3, sections "Introduction", "Direct surface manipulation applied to meshes", "Implementation doe real time interaction" and "Establishing connectively information"), and updating the mesh model to include the modified design parameter by direct mesh manipulation of a surface (see section "Establishing connectively information"); using Dirichlet parameter distribution to determine deformation of the surface of the mesh model (column 11 lines 9-14), Stewart does not teach using a Dirichlet parameter distribution; however, Beale teaches a surface of the mesh model affected by the modified design parameter is described using a Dirichlet parameter distribution to determine a displacement of the surface (col. 11, lines 9-15) so that the evaluation of the mesh model is used in the design of the product. It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the Dirichlet parameter distribution taught by Beale into the direct surface manipulation or Stewart for using a Dirichlet parameter distribution in to mesh modification, because using Dirichlet parameter distribution, it would satisfy a condition of orthogonality at all boundaries (col. 11, lines 9-11). Stewart in view of Beale do not specifically disclose wherein said computer system includes a memory, a processor, a user input device and a display device; and a computer generated geometric model stored is said memory of said computer system. This is disclosed in Hariya et al in column 4 lines 40-50. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have a user input device and a display device as in Hariya et al with the system of Beale because this would allow the user to change edit and the change the model for analysis.

**Claim 2,** Hariya et al discloses wherein the computer system includes a knowledge-based engineering library (model database) and the geometric model is stored in the knowledge based engineering library (column 4 lines 40-50). This would allow users as in Stewart in view of Beale to access the models built by other users so they don't have to waste building a particular model if it already exist.

**Claim 4,** Beale discloses wherein the computer system updates the mesh model using direct mesh manipulation, by modeling a surface as a lattice structure to determine the deformation of the surface (column 8 lines 23-31).

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart et al. "A real-time, interactive method for fast modification of large-scale CAE mesh models", Published September 2000 in view of Beale, U.S. (5,923,329), Hariya et al and further in view of Sederberg, U.S. Patent No. 4,821,214.

**Claim 3,** Beale with Hariya et al disclose wherein the computer system updates the mesh model using direct mesh manipulation (Beale, column 8 lines 23-31). However, Beale with Hariya et al do not disclose wherein a surface is modeled as a linear elastic sheet to determine deformation of the surface of the mesh model. This is disclosed in Sederberg in column 11 lines 60-68 and abstract. It would have been obvious to one of ordinary skill in the art at the time the invention was made to model the surface of Beale with Hariya as an elastic sheet because this would give the user a sense that the surface can deformed because it is elastic.

7. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart et al. "A real-time, interactive method for fast modification of large-scale CAE mesh models", Published September 2000 in view Blacker, U.S. Patent No. 5,315,537.

**Claim 9**, Stewart discloses selecting a geometric model, wherein the model is in a computer aided design (CAD) format (see page 2 "Introduction"); converting the CAD model into a mesh model (for manipulation of CAD surfaces, a direct mesh modeling technique was developed to allow the designer to quickly modify a mesh model by adding features to it; see page 2 "Introduction"); iteratively evaluating the mesh model until a predetermined response is generated by performing a CAE analysis of the mesh model (determining whether to vary a design parameter many of test traditionally performed on physical prototypes can be conducted with CAE simulations on finite element mesh models; many CAE applications require that the test be run on several revisions of a model; see page 1 "Introduction"); based on the CAE analysis (see section 1 "Introduction" pages 1-2); determining whether to vary a predetermined design parameter based on the CAE analysis; modifying the predetermined design parameter (see pages 2-3, sections "Introduction", "Direct surface manipulation applied to meshes", "Implementation doe real time interaction" and "Establishing connectively information"); updating the mesh model to include the modified design parameter using direct surface manipulation (DMM) of the mesh model; modifying the surface of the mesh model by the amount of the displacement; and using the updated mesh model (see pages 2-3, sections "Introduction", "Direct surface manipulation applied to meshes", "Implementation doe real time interaction" and "Establishing connectively

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information"). Stewart does not disclose wherein a surface of the mesh model is described as an elastic sheet and linear elastic finite element analysis is applied to determine a displacement of the surface. This is disclosed in Blacker in column 1 lines 35-42, 62-68 and column 2 lines 1-2. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use elastic finite analysis with the mesh manipulation method of Stewart, because this gave more accurate displacement information (column 1 lines 65-68 and column 2 line 1).

8. Claims 10, 11, 13-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stewart et al. "A real-time, interactive method for fast modification of large-scale CAE mesh models", Published September 2000 in view Blacker, U.S. Patent No. 5,315,537 and further in view of Beale (5,923,329).

**Claim 10**, Beale discloses defining an influence center for the feature (column 1 lines 30-50, whatever is modified is the influence center); modifying a mesh for the feature to include a node at the influence center (column 1 lines 30-50). Blacker discloses describing the deformed feature as a linear elastic sheet that is stretched (column 1 lines 35-42, 62-68 and column 2 lines 1-2); and determining the displacement of each node in the mesh of the feature using linear elastic finite element analysis (column 1 lines 35-42, 62-68 and column 2 lines 1-2). Although Beale does not specifically disclose bounding a feature on the surface of the model with a closed curve, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

**Claim 11,** Beale discloses wherein the maximum displacement of the surface is at the influence center (column 1 lines 30-50). It is inherent that in the modified portion the center is the pad that is displaced maximally.

**Claim 13,** Beale discloses determining a position of a node for the mesh with respect to the lattice boundaries (column 3 lines 15-25); deforming a lattice point a predetermined displacement (column 1 lines 30-50, wherever the point is moved to is the displacement). Blacker discloses using linear elastic finite element analysis to determine displacement of the lattice point (column 1 lines 37-42, 62-68 and column 2 lines 1-2); and determining displacement of mesh nodes within the lattice to maintain their position with respect to the lattice boundary using linear elastic finite element analysis (column 1 lines 37-42, 62-68 and column 2 lines 1-2). Although Beale does not specifically disclose bounding a region of the mesh containing the surface with a lattice, this would have been obvious to one of ordinary skill in the art at the time the invention was made because this allows the user to specify what portion of the model to modify.

**Claim 14,** Beale does not specifically disclose wherein said lattice point is a corner point of the lattice structure. However, since the point to be modified is determined by the user the user can choose any point including corner points.

**Claim 15,** Beale discloses wherein the lattice point is a point within the interior of the lattice (column 5 lines 63-65).

**Claims 16-18,** Stewart discloses the feature is a self-contained geometric entity on the surface of the mesh model (see section "Introduction", Direct surface manipulation applied to meshes, fig. 1, page 2).

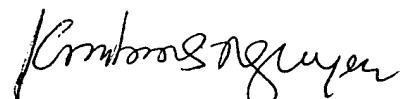
***Response to Arguments***

9. Applicant's arguments with respect to claims have been considered but are moot in view of the new ground(s) of rejection.
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kimbinh T. Nguyen whose telephone number is (571) 272-7644. The examiner can normally be reached on Monday to Thursday from 7:00 AM to 4:30 PM. The examiner can also be reached on alternate Friday from 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached at (571) 272-7782. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

October 3, 2005



KIMBINH T. NGUYEN  
PRIMARY EXAMINER